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SC web highlight

F. Perez, A. Kemp, L. Divol, C. Chen, P. K. Patel

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Disclaimer

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SC Web Highlights Template

SC-2 :: October 4, 2012

Each of the following boldface items is a required element for highlights submitted for posting on the SC website. Please see the "Web Highlights Guidance & Example" document for specific guidelines for each item.

Title:

(Provide a 10-15 word title that is interesting and understandable by a general audience)

Relativistic electrons steered by magnetic fields in ultra-intense laser-matter interactions

Subtitle:

(Provide a 10-15 word subtitle that will only be used on the highlights "table of contents" landing page(s) of the website (it can repeat information from the next two entries). The goal for the subtitle is to provide further information that will encourage people to read more.)

Strong magnetic fields produced by low levels of reflected light can play an important role in intense laser-matter interactions

The Science:

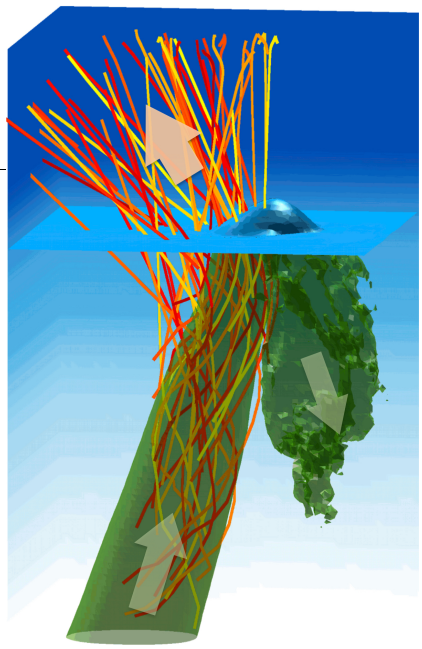
(Provide a one to two sentence summary of the science that was accomplished; this should be understandable by a non-specialist, science savvy reader)

A picosecond duration, petawatt power laser pulse interacting with a solid material accelerates electrons to relativistic energies. New studies have shown that the small fraction of light reflected from the surface generates strong magnetic fields which can alter the electron trajectory in an unexpected direction.

The Impact:

(Provide one to two sentences on why the research was important. This could be technological or potential technology impact, science-based (long sought understanding, etc.), or capability-based (new instrumentation or technique with high impact).)

The intense fluxes of relativistic electrons produced in laser-matter interactions have applications in a multitude of areas including ultrafast heating of high-energy-density plasmas, inertial fusion, positron production, and ion acceleration. Understanding the complex physical mechanisms of light absorption and electron acceleration is critical to continued advances in these fields.



High Resolution Image (Required Attachment):

Provide at least one eye-catching high resolution image from the PI (JPEG or TIFF, ideally 300 dpi, > 150 dpi acceptable). This image will appear in thumbnail view on the "table of contents" landing page(s). On the highlight page the image will be "expandable" to full size on a click. A visually appealing high resolution image is critical to the highlight's viability on the web and in other visual media contexts (presentations, print, display, etc.).

Image Caption:

(Short figure caption; include institutional image credit)

The laser beam (green) interacting with a plasma (blue) accelerates multi-MeV electrons (orange) in a different direction.

Second Image for Highlights "Table-of-Contents" Landing Page(s) (Optional Attachment):
Optionally, provide a second eye catching image from the PI that would be able to conform to a landscape format.

Summary:

(Provide a short paragraph (~175 words) that provides additional detail. The summary can include another figure if appropriate. This information can go into somewhat more technical depth than the sections above, but should still be interesting/readable for an intelligent non-technical audience)

Tightly focusing a high-power laser beam on a slab of solid material quickly creates a hot plasma. The electrons initially bound to the matter are pulled apart by the laser light and accelerated to high energies, creating magnetic fields—among the strongest on Earth. New research demonstrates that even the reflected light is powerful enough to accelerate electrons, now in the opposite direction, creating magnetic fields of opposite polarity. These fields deflect the forward-going electrons away from the laser axis, shedding new light on the acceleration mechanism of energetic electrons by intense lasers.

Contact(s):

*(Provide **PI contact name, institution, and email**. Another contact can be added if appropriate (an institution communications person, technology transfer person, another PI, lab coordinator, etc.))*

Frederic Perez, Lawrence Livermore National Laboratory, perez75@llnl.gov

Funding:

DOE Office of Science, Office of Fusion Energy Sciences

Publication(s):

(List relevant publication citations (at least one): author(s), title, year, and journal (include journal name, volume, and page number: DOI).)

F. Pérez, A. J. Kemp, L. Divol, C. D. Chen, and P. K. Patel, Deflection of MeV Electrons by Self-Generated Magnetic Fields in Intense Laser-Solid Interactions, Phys. Rev. Lett. 111, 245001 (2013)

Related Links:

(List relevant links, as appropriate; for example, links to press releases on the topic, SC Stories of Discovery and Innovation, company links (if appropriate for highlights that involve commercial use of science, etc.).)

N/A

Date:

Provide the date for the highlight that will be shown on the website; in the future this will undoubtedly be the date that we post the highlight, but for older highlights we need to provide an appropriate date, which might be the date of the publication or another appropriate date for the technology highlights. Please indicate the basis for the selected date.

Paper published 9 December 2013